EOSDIS Core System Project

Data Management Plan for the ECS Project

Revision 1

January 1995

Hughes Applied Information Systems
Landover, Maryland

Data Management Plan
for the
ECS Project

Revision 1

January 1995

Prepared Under Contract NAS5-60000
CDRL Item 004

SUBMITTED BY

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Hughes Applied Information Systems

Landover, Maryland

104-CD-001-003

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Preface

This document is a formal contract deliverable and has been approved by the Government for acceptance and use. This revision accommodates change requests/improvements to the Data Management process. These changes are considered Class II (i.e., not affecting cost or schedule) and therefore do not require Government approval prior to their acceptance and use. Further updates to this document are not anticipated at this time.

This document is under ECS Project Configuration Control. Any questions should be addressed to:

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Abstract

The purpose of the ECS Data Management Plan (EDMP) is to establish the methodology for administering the project requirements for data management, and for providing efficient and cost-effective storage, maintenance, control, and dissemination of these data. The documents and data managed by this function consist of Contract Data Requirements List (CDRL) and other documents required by contract Review and other presentation materials, technical papers and white papers; and other pertinent data such as contract correspondence, progress reports, and background information.

The EDMP was originally submitted and approved by GSFC in Fall 1993 as document number 193-104-MG1-001. This revision accommodates change requests/improvements to the Data Management process. Further updates to this document are not anticipated at this time.

Keywords: DMO, EDHS, documents, CDRL, control, storage, delivery, review, library, catalog

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Change Information Page

List of Effective Pages	
Page Number	**Issue**
Title	Revision 1
iii through x	Revision 1
1-1 and 1-2	Revision 1
2-1 and 2-2	Revision 1
3-1 through 3-8	Revision 1
4-1 through 4-16	Revision 1
AB-1	Revision 1

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1. Introduction

1.1   Identification

This document is submitted as required by Data Item Description (DID) 104/MG1 for the ECS Data Management Plan for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) contract. This document was previously submitted as identified in the Document Hispory, page vii of this submittal.

1.2   Scope

This plan defines and describes the organization, work activities, and methods that are to be used to ensure effective management of data and documentation related to the design, development, integration, test, and operation of the EOSDIS Core System. The data management (DM) requirements in this plan are applicable to ECS data and documentation being supplied by the ECS prime contractor, Hughes Applied Information Systems, under the ECS contract. The requirements of this plan are also binding on the prime's subcontractors.

1.3   Purpose and Objectives

The purpose of the ECS Data Management Plan (EDMP) is to establish the methodology for administering the project requirements for data management, and for providing efficient and cost-effective storage, maintenance, control, and dissemination of these data. The documents and data managed by this function consist of Contract Data Requirements List (CDRL) and other documents required by contract Review and other presentation materials, technical papers and white papers; and other pertinent data such as contract correspondence, progress reports, and background information. Specific procedures relating to DM activities will be covered in the ECS Data Management Procedures (DID 105/MG3).

The objectives of this plan include: maximizing control at the responsible level, maximizing responsiveness, and creating a service-oriented organization which will provide standard tools and processes that can be universally applied. The size and technical complexity of the ECS Project, together with the coordination and interface with the customer, Goddard Space Flight Center (GSFC), mandates interpreting the Data Management function as a service provider to ECS.

1.4   Status and Schedule

The EDMP was originally submitted and approved by GSFC in Fall 1993 as document number 193-104-MG1-001. This document as submitted is a revision to accommodate change requests/improvements to the DM process. These changes are considered Class II (i.e., not affecting cost or schedule) and therefore do not require Government approval prior to their acceptance and use. Further updates to this document are not anticipated at this time but shall be made as necessary.

1.5 Document Structure

This document follows content organization specified in NASA-STD-2100-91, DID999, and consists of six sections:

Section 1 — Introduction

Section 2 — Related Documentation

Section 3 — Data Management Organization and Responsibilities. This section provides an overview of the organizational responsibilities and relationships of ECS data management. This section also describes the resources and tools used to produce, record, process, store, and disseminate required ECS documentation.

Section 4 — Data Management Activities. This section provides an operational view of data management and control through the lifetime of ECS documentation: CDRL preparation, submittal, and revision, and the ECS Data Management Organization (DMO) approach to data archive, control, and retrieval; and the interface between these functions and the operational databases which will be used to operate the system.

Section 5 — Appendix A provides a list of abbreviations used in the EDMP.

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2. Related Documentation

2.1 Parent Documents

The following documents are the parent from which this document's scope and content derive:

101-101-MG1-001   Project Management Plan for EOSDIS Core System, 7/93

194-107-MG1-010   Level 1 Master Schedule for ECS Project, 10/94

423-41-01   Goddard Space Flight Center, EOSDIS Core System Statement of Work , through CN-09, 8/31/94

423-41-02   Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System , 6/24/94

423-41-03   EOSDIS Core System Contract Data Requirements Document, 6/2/94

NASA-STD-2100-91   NASA Software Documentation Standard, Software Engineering Program; approved 7/29/91

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this plan:

194-102-MG1-001   ECS Configuration Management Plan for the ECS Project, 3/94

500-TIP-2110   Mission Operations & Data Systems Directorate Specification -- Document Formats, Revision 1; 8/92

500-TIP-2201   GSFC Mission Operations & Data Systems Directorate Standard -- Language Style for Documents; 5/90

500-TIP-2601   GSFC Mission Operations & Data Systems Directorate Standard -- Automated Interchange of MO&DSD Technical Information; 11/17/89

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding:

193-105-MG3-001   Data Management Procedures for the ECS Project, 8/93

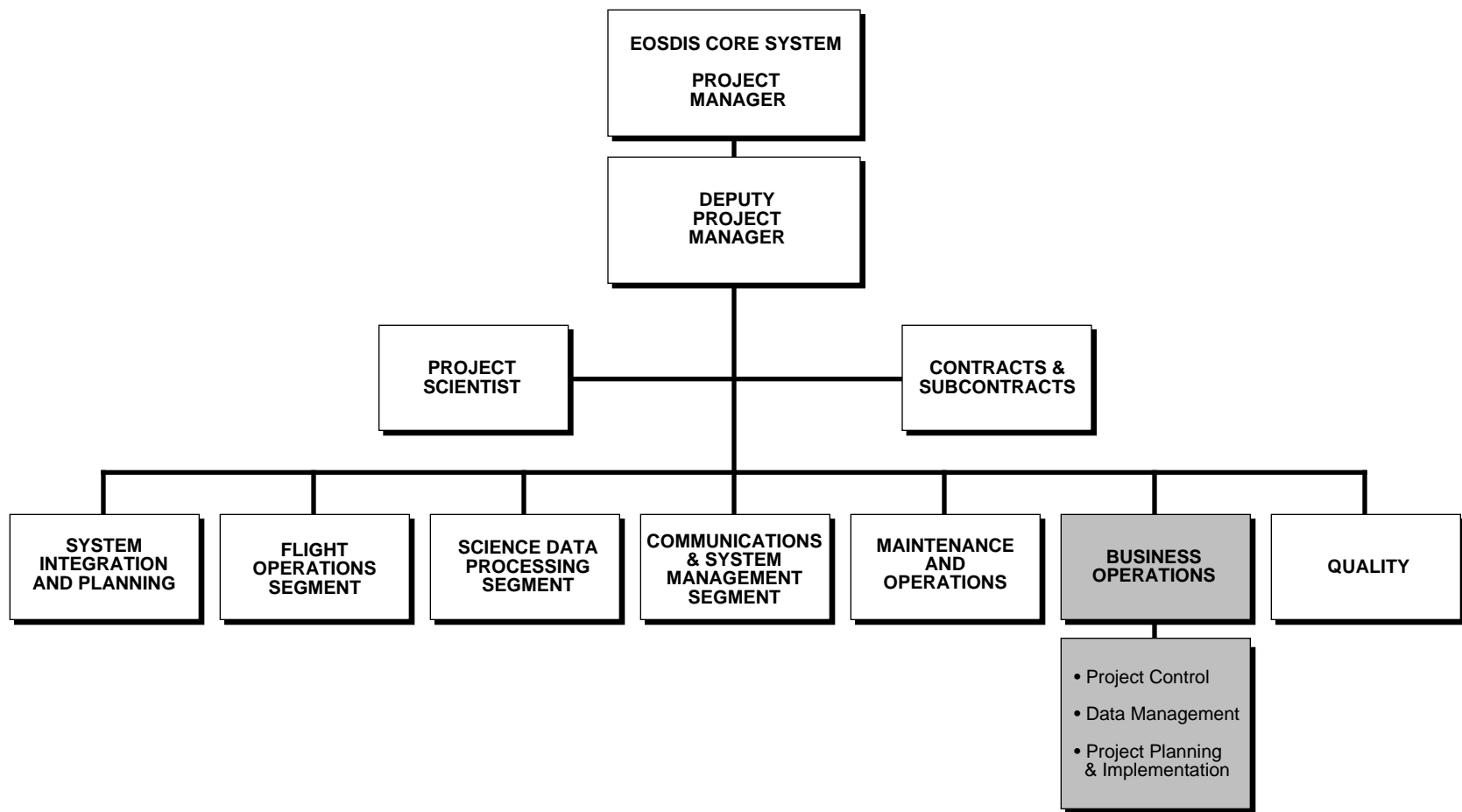This page intentionally left blank.

3. Data Management Overview

3.1   Data Management Goals and Objectives

The primary goal of the ECS Data Management Office is to provide the data services functions necessary to create, control, deliver, archive, and update data critical to documenting the development of ECS. Its secondary purpose, broader in scope, is to organize and provide access to relevant ECS-related information such as standards, meeting notes, science user requirements data, and vendor reference manuals. The objectives of the ECS Data Management Office are to:

- Establish all documentation and data requirements, including specifications and standards to be followed in generating and transmitting text and engineering drawings, and to ensure accurate and timely preparation of these deliverables.

- Establish task assignments and schedules for document preparation and release; coordinate with ECS offices responsible for generating documents to ensure on-time schedule.

- Establish and maintain procedures for controlling document masters, preparing formal document changes, and keeping auditable records of changes.

- Maintain status records and produce status reports for tracking and controlling the deliverable documentation specified on the CDRL.

- Coordinate and ensure the release of all final documents in hard copy and electronic media in accordance with the approved standards.

- Establish and ensure procedures for collecting, maintaining, and controlling all data used in the development of ECS, and for disseminating information to appropriate users.

- Implement and operate an on-line automated ECS Data Handling System (EDHS) that permits users with network access to interactively search and download documentation within the confines of system security constraints.

3.2   Data Management Organization and Responsibilities

Figure 3-1 shows the overall organization of the ECS Project. The Data Management Organization (DMO) is a part of the Business Operations Office, which provides centralized management services, including schedule and cost reporting, and data management. The DMO is viewed as a support organization to the ECS Project team, the GSFC EOSDIS project office, personnel at archiving centers and other agencies, and consumers within the science community.

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EOSDIS CORE SYSTEM

PROJECT MANAGER

DEPUTY PROJECT MANAGER

PROJECT SCIENTIST

CONTRACTS & SUBCONTRACTS

SYSTEM INTEGRATION AND PLANNING

FLIGHT OPERATIONS SEGMENT

SCIENCE DATA PROCESSING SEGMENT

COMMUNICATIONS & SYSTEM MANAGEMENT SEGMENT

MAINTENANCE AND OPERATIONS

BUSINESS OPERATIONS

QUALITY

- Project Control

- Data Management

- Project Planning & Implementation

Figure 3-1. ECS Project Organizations

It is important to note that DMO works closely with the Configuration Management Organization (CMO) located within the System Integration and Planning Office. DMO is responsible for maintaining ECS data/documentation. Included in this information are documents under the control of the ECS Change Control Board (CCB) and Project Segment Office CCBs. The point of contact for any changes made to CCB documents is the CMO with CMO processing, changes against controlled documents are forwarded to the respective CCB for approval. If the package is approved, CMO coordinates with DMO to incorporate the change into baseline documentation and to distribute the package.

## 3.3   Data Management Responsibilities

Responsibility for the integrity, completeness, and timeliness of ECS Project data/documentation is shared across the ECS Project organization. Project Offices/Segments (e.g., Science, System Integration and Planning, Flight Operations) are responsible for the authorship and content of CDRL items within their technical disciplines and areas of responsibility. The Quality Office reviews all CDRL documents and data for incorporation of quality requirements. And, as mentioned above, Configuration Management takes responsibility for configuration identification, change control, status accounting, and auditing of all CDRL items.

It is DMO's responsibility to provide a strong focal point for establishing the data management program, and to work closely with all ECS offices to effect successful implementation and maintenance. The DMO also serves as the data archive and storage agency for the ECS Project and administers the centralized, automated data repository and retrieval system.

As shown in Figure 3-2, DMO responsibilities encompass three functional areas:

- Data Requirements refers to the deliverable documentation specified in the Contract Data Requirements List as well as other data required to adequately document the ECS Project. These requirements direct the data management effort on the ECS Project and are the focal point within the Project on all matters concerning documentation. Activities that support data requirements encompass all monitoring and coordination tasks including interpreting CDRLs and communicating these requirements to the appropriate functional office for implementation; scheduling and status reporting; reviewing documents for Contract Data Requirements Document (CDRD) compliance; and interfacing with CCB activities.

- Data Control activities, housed in the Document Center, focus on the efficient archive, storage, and maintenance of DMO-maintained documentation including CDRL items, technical papers, white papers, action items, customer correspondence, and other Project-related documentation agreed upon by GSFC and Hughes. Document Center staff maintain baseline document versions in a controlled library. Documents are disseminated from DMO, either from the Reference Library in hard copy or via EDHS electronic transmission, and DMO staff are the point of contact for answering inquiries and filling requests for copies of stored documentation.

- Data Support provides broad coverage in two areas:

    – The Documentation Coordination staff, which is responsible for all activities required to prepare CDRLs and other documentation required by contract. This includes format editing, document coordination, graphics, layout, and reproduction. DMO staff are the "institutional knowledge" for GSFC document and graphics standards and specifications and have primary responsibility for ensuring ECS compliance. Documentation Coordination is also responsible for formatting deliverables for electronic transmission.

    – Management information systems staff, which provides support as necessary to design, develop, and maintain the databases used for tracking, monitoring, and statusing documentation. The systems staff is also responsible for the interface between DMO and ECS operational databases, and oversee such functions as data security, access control, and system backup/disaster control.
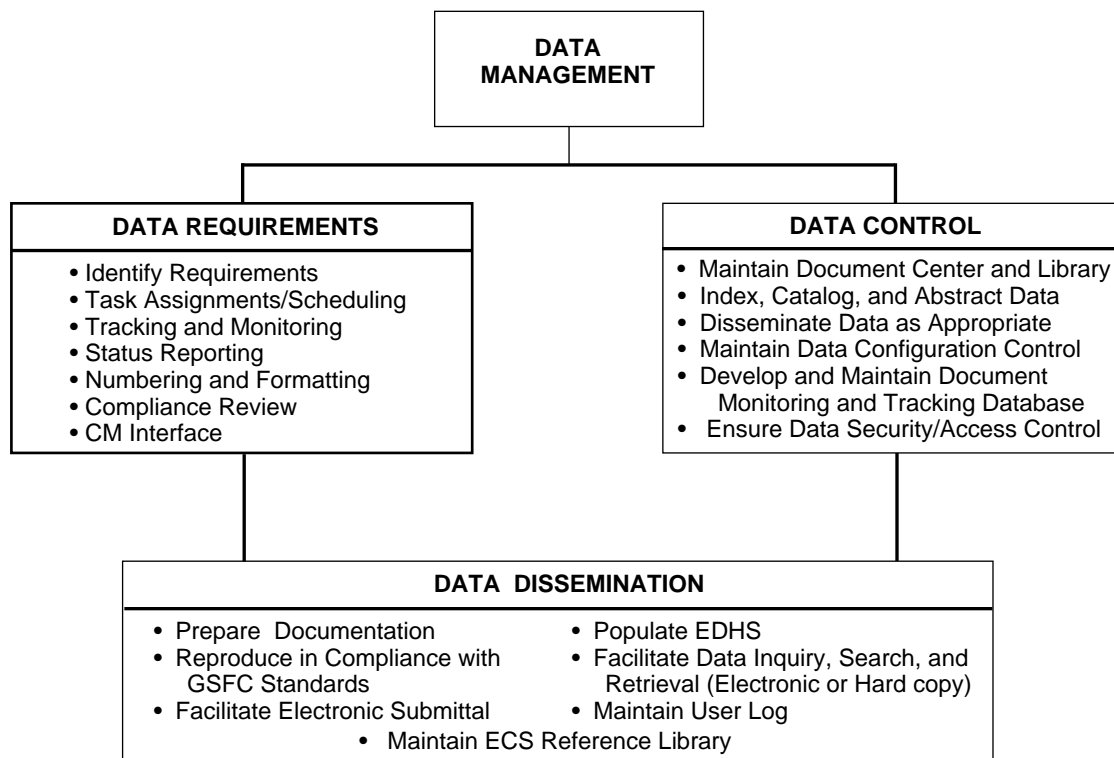
Figure 3-2. Data Management Activities and Support

3.4   Data Management Interfaces

ECS data management policy is driven by the anticipated volume of data and documentation, the need to manage constant change, and the wide geographic distribution of ECS. These challenges require universal compliance to stringent data management procedures throughout the life of the Project. Equally important, because CDRLs and project documentation are generated or used by all ECS Project offices and many external, ECS-related organizations, these organizations are all directly affected by DMO practices and procedures.

For internal ECS organization interfaces, DMO establishes information flow requirements with Project offices, including subcontractors, and coordinates and tracks planning and preparation of contract required data and subsequent revisions. The responsible offices assign requirements to individuals who interface with DMO in performing the data management functions described in this Plan. DMO works with ECS office managers to determine effective means for archiving and retrieving data, and assists all staff with data search and retrieval.

For GSFC interfaces, the manager of DMO is the primary point of contact for data management information and concerns. A direct working interface with the GSFC data management function has been established to ensure adequate attention to GSFC requirements such as format standards and specifications for generating and transmitting text and engineering drawings. As appropriate, the DMO will assist GSFC in updating the CDRL, and in identifying additional supporting ECS documentation to be archived and maintained. DMO maintains the EDMP and distributes updates as required through the GSFC/ECS data management interface.

3.5   Data Management Resources

The following sections describe the ECS resources and tools that are used to produce, record, process, store, and disseminate required ECS data/documentation.

3.5.1 Standardized Document Production and Transmission

A standard set of software applications will be used across all levels of the ECS Project. This standard set is delineated in the Data Management Procedures (DID 105/MG3) and is in agreement with GSFC requirements. The use of this common set of production tools by both the development personnel and documentation staff substantially reduces many redundant activities such as key stroking, art preparation, and so forth. DMO also develops and makes available templates and standard style sheets for text and graphics generation, and provides orientation training and ad hoc technical assistance to ECS staff. These tools, which serve as the standard for all deliverable documentation preparation and transmission, are derived from format standards and specifications recommended by GSFC: 500-TIP-2110, GSFC Mission Operations & Data Systems Directorate Specification -- Document Formats, Revision, 8/92; 500-TIP- 2201, GSFC Mission Operations & Data Systems Directorate Standard -- Language Style for Documents, 5/90 and 500-TIP-2601, GSFC Mission Operations & Data Systems Directorate Standard -- Automated Interchange of MO&DSD Technical Information, 11/17/89.

3.5.2 ECS Document Center and Reference Library

A primary responsibility of the DMO is the establishment and maintenance of the ECS Document Center and Reference Library. The Document Center is the repository for all DMO-Maintained document masters (both hard copy and electronic), and Document Center staff is responsible for ensuring that all DMO-Maintained document masters are archived and can be retrieved on demand. The Reference Library houses copies of DMO-Maintained documents, ECS-related documents, and all outside documentation for use by ECS Project staff.

The Reference Library is located in the ECS Development Facility (EDF) and houses the following equipment:

- Computer workstation with access to EDHS
- Magnetic or optical disk storage
- Small copier and work table (in adjacent partitioned area)
- Hardcopy document storage shelves
- Locked document master files
- Video tape storage cabinets
- Desks, tables, chairs

3.5.3 ECS Data Handling System (EDHS)

DMO staff will make extensive use of the ECS Data Handling System (EDHS). As shown in Figure 3-3, EDHS is an on-line, automated system providing a comprehensive repository of documents and Project-related data. The system serves all ECS contractor team members, NASA/GSFC, the Distributed Active Archive Centers (DAACs), and scientists worldwide, providing search, review, and retrieval capability. Its primary objective is to provide simple, single-point-of-access to facilitate open communication among government agencies, contractors and the science community. To this end, information on data collections, tools, and utilities is built into the system with hypertext links.

The EDHS was designed to use existing technologies and publicly available tools and software. Increasing use of the Internet and the widely popular WorldWideWeb led to the development of an enhanced version of the Wide Area Information Server (WAIS) using modified freeWAIS to enable metadata searches. To access these resources, users need a client "browser" such as Samba, Cello, Viola, Midas, NeXTStep Browser, CERN Line Mode Browser or EINet's MacWeb and WinWeb, etc. The most popular of the browsers currently, however, is Mosaic, from the National Center for Supercomputing Applications (NCSA) at the University of Illinois, Urbana-Champaign. The overall EDHS design is written with Hyper Text Markup Language (HTML) and is organized with what is commonly called a "home page." From there, the user can browse, following highlighted links to specific document collections or perform searches (including Boolean) on certain data. Users may search for archived documents and Project-related data based on descriptive characteristics maintained for each entry as keywords and metadata. A list of 'hits' is returned to the user to select items of interest by title. Each selection

can be reviewed on-line or downloaded to their local desktop or workstation. Desktop data is appropriate whenever the user has the necessary tool for display, manipulation, and print. Many of the tools for viewing on-line or printing are available as freeware on the Internet and can be accessed from the EDHS.

EDHS text collections are comprised of numerous documents which are available at multiple service levels. These collections include Contract Data Requirements List items (CDRLs), Technical and White Papers, and other ECS-generated reports and documents, as well as documents not generated by ECS which are highly relevant to ECS development.

To allow for a quick and easy search through all text document types in the openly accessible "community" collections, a combined metadata index is provided. Metadata is specific "data about data," primarily document number, title, author/creator, etc., to include an abstract and keywords. Thus, this index provides information about the different documents available in the community collections and expedites your search across these holdings.

Subsequent document and report collections may not be available for the community at large and will not be delivered via a WAIS search. In such a case, the collection may include draft material intended for a specific review and of limited distribution. These data items are in a separate database that may require a user/password pair for access. Once access is granted, the data items may be located via catalogs and hypertext links. Other instances may restrict distribution to an identified network domain, whereupon only users identified by Internet Protocol (IP) address may be allowed access to the data. Again, a WAIS search will not return a title from a protected collection.
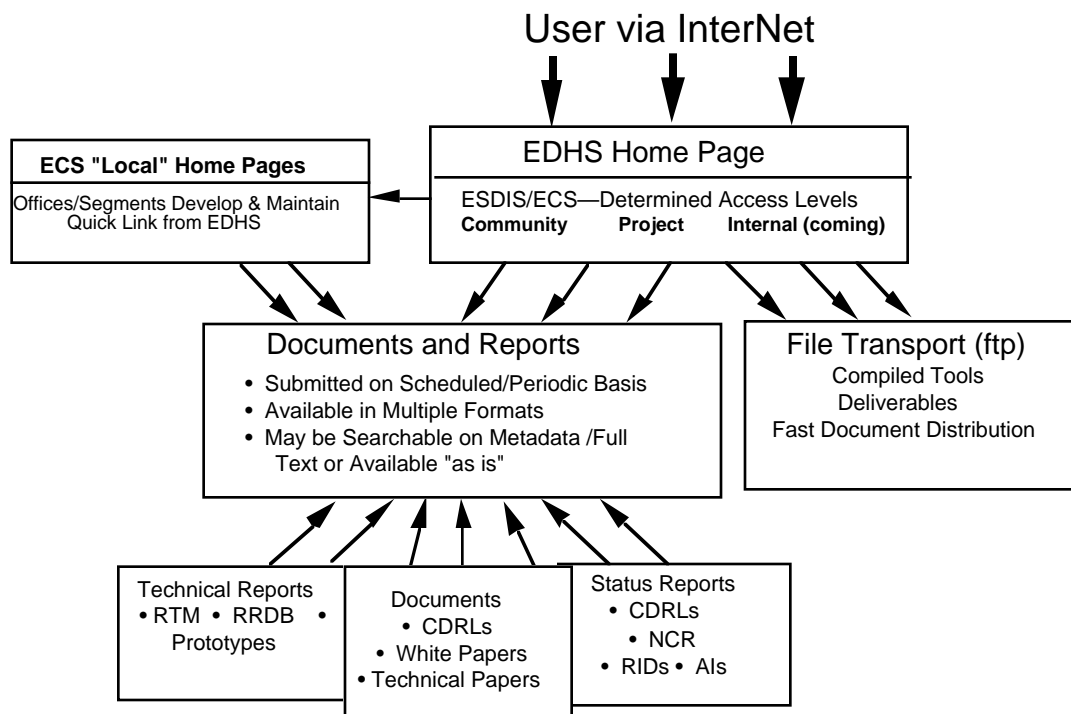
Figure 3-3. ECS Data Handling System (EDHS)

3.5.4 Configuration/Data Management Tracking System (CDMTS)

The CDMTS is a single integrated, comprehensive system used to log, track, status, and expedite DMO-maintained and ECS-related documentation generated across the project. CDMTS also provides the audit trail of the source and disposition of changes against configuration-controlled documentation. The system also tracks Action Items across the project and links outstanding actions to pending document updates or revisions, if appropriate.

This custom designed system uses the Microsoft Foxpro relational database software application, allowing varying levels of access across the project. Depending on the user's requirements, different screens and reports have been designed. For example, administrative support personnel may need to access the database to get a document number assignment for someone in their segment workgroup. Select screens are limited to specific functions, such as Configuration Management, and Data Management. Data entry to CM or DM related fields is restricted to authorized personnel within those departments. For example, CMO accesses the system when issuing an authorized Document Change Order (DCO). This in turn, permits DMO to generate a DCN for the indicated document(s). In fact, the system "locks" any changes to documents unless an approved DCO has been entered by the CMO. At any time, the DMO can query the tracking system to determine any changes that are pending with the CCB.

Several required reports are generated from the system. It is the CDMTS that produces a document delivery status report and Configuration Change Board reports, which are included in the Monthly Progress Report. In addition, ad hoc reports can be produced as user's requirements dictate.

3.5.5 DMO Transfer Station

A dedicated Macintosh computer has been established as a transfer station for all completed contractual deliverables and other DMO-Maintained data. This DMO Station functions as a server for the DMO staff and is password protected for access only members of the DMO group.

The DMO Station contains separate, specific directories for transferring files to be archived, and, concurrently, processed for the EDHS. Additionally, directories may be set up for each DMO user to allow quick access to DMO-specific files or files too large to be transmitted via local email systems.

4. Data Management Activities

As indicated in Figure 4-1, DMO plays an active role throughout the life of ECS data and documentation. Generally this role is divided into two broad functions: 1) CDRL preparation, production, monitoring, and delivery; and 2) data storage, control, and retrieval. DMO's activities are described in the following sections.
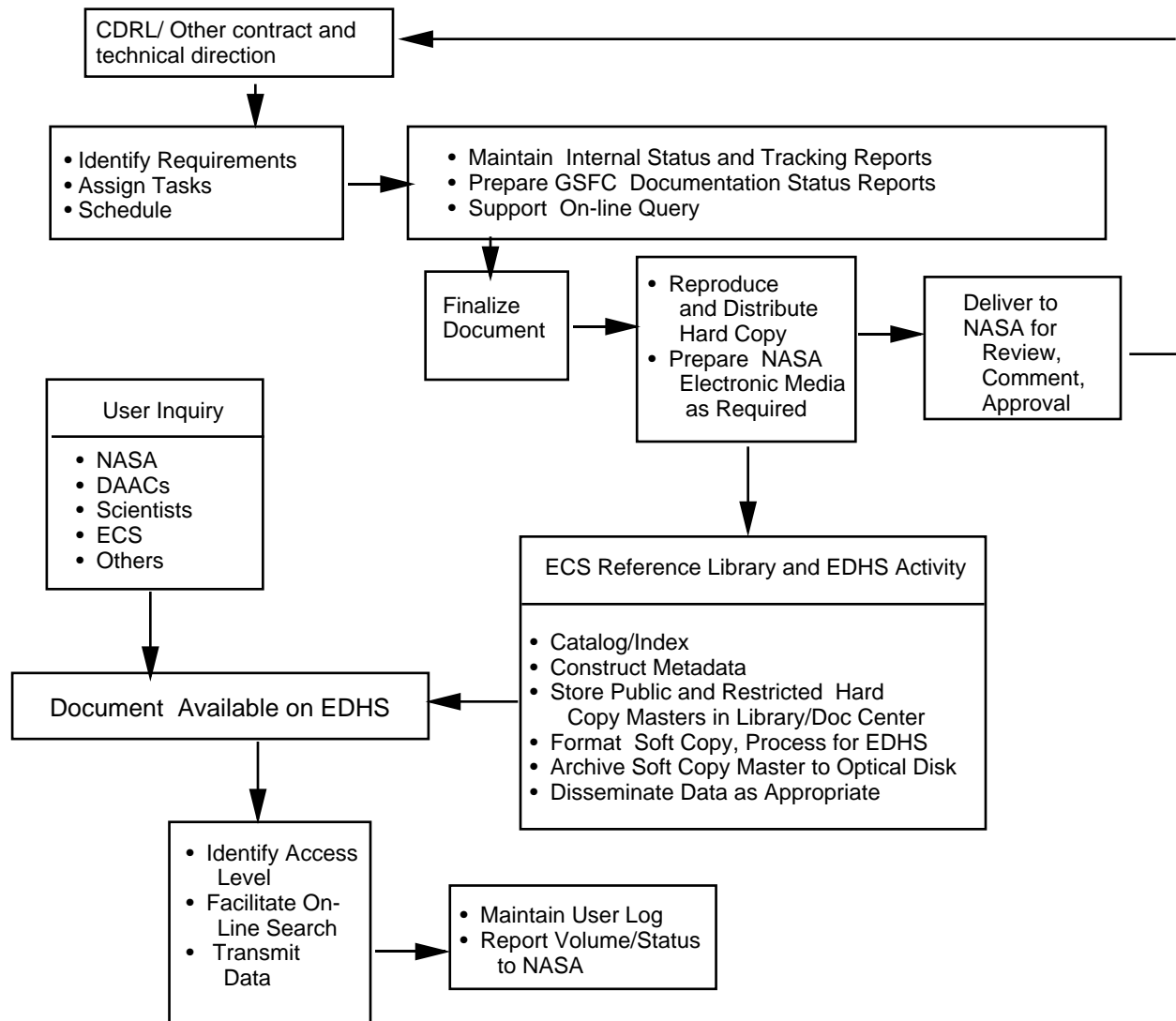
4.1 Identifying Data Requirements

The DMO is responsible for ensuring that all documentation/data requirements are identified for any given activity. The CDRD, Hughes procedures, and ECS Project Instructions establish the requirements for document content, generation, distribution, and delivery. DMO has responsibility for maintaining and updating the CDRL and internal data master requirements. DMO also facilitates reviews to determine whether data items produced are adequate for their intended use and relays the results to ECS Project management. The goal is to establish the data/documentation required to fulfill Project needs and to avoid unnecessary or overly detailed and costly data/documentation.

A comprehensive documentation tree will be developed for each ECS activity or major milestone through the life of the Project, which drives the master schedule of CDRL requirements. Figure 4-2 provides a sample CDRL documentation tree within one ECS functional area. For each ECS activity or milestone [e.g., the Program Management Review (PMR)], DMO develops a documentation development and control matrix. This matrix identifies all contract required data that will be prepared to support the activity or milestone, and, at the office level, the originator of each data item and any dependencies. It also includes customer approval levels and anticipated review cycles; notes which documents are under configuration control and at what level, confirms production format and transmission requirements for each, and establishes responsibility for the review and sign-off of the data item.

4.2 Task Assignments and Scheduling

The data item preparation assignment is entered into a master schedule by DMO after acceptance of the task by the responsible ECS office. When the responsible office identifies inputs required from other offices and subcontractors, these requirements are also noted. Information concerning the internal review and signature approval is confirmed and entered into the schedule. Finally, anticipated production requirements such as size of document, number of tables, and reproduction and delivery timeframes are discussed and factored into the production time line. Figure 4-3 provides a sample of this master schedule. DMO coordinates preparation planning with the responsible office/segment to ensure understanding of required content, format, preparation requirements, and the schedules that must be maintained and enforced.

Reports are generated, arraying data in a variety of ways to track working level commitments for each function identified in the planning process, and are made available to the ECS offices responsible for preparing required documentation.

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Figure 4-1. Data Management Process

DOCUMENT TREE FOR EOSDIS CORE SYSTEM PHASE C/D CONTRACT

Revised 30 April 1993

Project

Management

ECS project
management plan

Management reports

**Program
management
review**

New or critical processes,
specs, and/or procedures

Schedule
management plan

ECS system
engineering plan

ECS configuration
management plan

ECS data
management plan

Procurement
management plan

ECS life cycle cost report

Methodology for definition
of external interfaces

**System
requirements
review**

Level 1
master schedule

ECS standards and
procedures

Configuration
management procedures

ECS data management
procedures

Intermediate logic
network diagram

Tradeoff studies
analytical data report

Project development history

Version 0 analysis
report

**System
design
review**

ECS system integration
and test plan

ECS system integration
and test procedures

Performance measurement
status reports

Property
management plan

Risk assessment report

Contractor workmanship
procedures proposed
stds of NASA NHB

**Release
initiation
review**

ECS security plan

Risk assessment report

Performance measurement
status reports

Tradeoff studies
analytical data report

**Segment
preliminary/
incremental
design review**

Security sensitive
items list

Segment/element
integration and test plan

Request for delegation
of MRB author to a supplier

**Prototyping
results review**

Security sensitive
items list

Segment/element integration
and test procedures

**Element
critical
design reviews**

Risk assessment report

**Test
readiness review**

Segment/element integration
and test procedures

**Segment/element
test review**

New or critical processes,

Segment/element
integration and test report

**Consent to
ship review**

Segment/element
integration and test report

ECS system integration
and test report

**Capabilities and
requirements review**

ECS system integration
and test report

Notes:

1. The ECS comprises three segments and six elements as listed below.
The CDRL items listed here will be prepared as noted per each
element/segment

   Flight Operations Segment
   • EOS Operations Center
   • Instrument Control Centers

   Science Data Processing Segment
   • Distributed Active Archive Centers
   • Information Management System

   Communications and System Management Segment
   • Systems Management Center
   • ECS Science Network

2. The triangle symbol shown below means that a given document is a
revision/update of the prior baseline document

3. The line size of the CDRL box outline connotes the Configuration
Management Level as follows:

   3-point means Level 1 document requiring
   government approval and optional
   Government CCB control

   2-point means Level 2 document not requiring
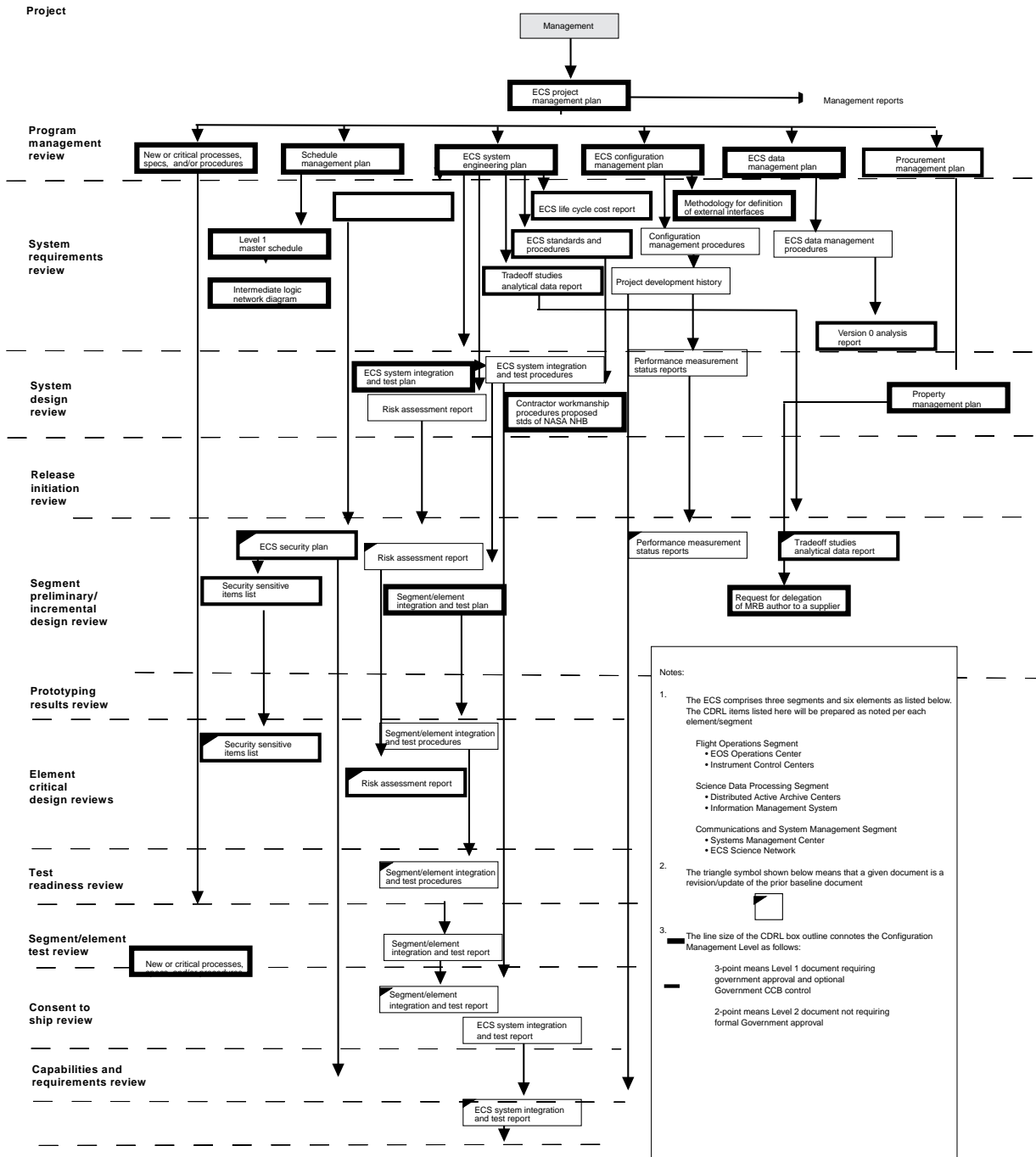   formal Government approval

Figure 4-2. Sample ECS CDRL Documentation Tree

SDR DOCUMENT DELIVERIES

Doc No.	Document Title	Book Boss/ Phone	Page Count	Graphics, HW/SW, Help Info					Qnty for Del	Document Due to CM for CCB	Board Control/ Date	Type Delivery/ Date	Type Delivery/ Date	FINAL Delivery/ Date	Milestone/ SDR Due Date	Notes
				Total # in doc	Hardware	Software	Contact	Need Aid?								
102-MG1	ECS Configuration Management Plan	K. Wheeler 0322							200	N/A	Project Mgmt	Internal 3/4/94		3/31/94		*Delivered 3/30/94*
201-SE1	ECS System Engineering Plan	G. Percivall 0368	150-200	35	Mac	MacDraw Pro	George	possibly	200	5/11/94	ECS CCB 5/18/94		GSFC review 4/13/94	5/31/94	SRR Workoff	*Delivered 6/8/94*
202-SE1	ECS Standards and Procedures	H. Emerson 0619	350	15					200	6/8/94	ECS CCB 6/15/94			6/24/94	SRR Workoff	
206-SE2	Version 0 Analysis Report	J. Feldman 0332	400	a few	Mac	MacDraw Pro	*P. Roycroft	YES-with 2 (Paul)	200? ?	N/A	Project Mgmt			(4/26/94) 5/5/94	SDR -2 wks	*Delivered 5/13/94*
207-SE1	ECS System Design Specification	A. Meilich 0605	400-500 each vol	many - # unknown	Mac	MacDraw Pro and StP (OMT)!		with StP YES	200	6/3/94	ECS CCB 6/10/94	Review 5/20/94	Preview 6/6/94	6/13/94	SDR -2 wks	
219-SE1-001	IRD Between ECS and External Networks (NSI)	M. Armstrong 0439	10-15		PC				*25	5/27/94	ECS CCB 6/6/94	Draft 5/9/94	Baseline 5/31/94	Baseline 6/13/94	SDR -2 wks	
219-SE1-002 (P)	IRD Between ECS and MITI (ASTER)	C. Chachulski x0661 S. Banaszak x0649	30	10	Mac	MacDraw Pro	same	no	*25	4/15/94	ECS CCB 4/25/94			Prelim 5/2/94	SDR -2 wks	*Delivered 4/29/94 Delivered errata 5/11/94*
219-SE2-003 (P)	IRD Between ECS and Landsat 7	J. Kramer x0656 S. Banaszak x0649	25	2	Mac	MacDraw Pro	Sandy Banaszak	possibly	*25		ECS CCB later date	Wrk Copy 2/25/94	Wrk Draft 4/18/94	Wrk Draft 6/13/94	SDR -2 wks	
219-SE1-004	IRD Between ECS and Version 0	J. Kramer x0656 C. Van Vliet x0613							*25	5/19/94	ECS CCB 5/27/94	Wrk Draft 2/9/94	Draft 3/25/94	Baseline 6/3/94	SDR -2 wks	*Delivered 6/8/94*
219-SE1-005	IRD Between ECS and SCFs	S. West 0770			PC				*25	5/25/94	ECS CCB 6/2/94	Draft 1/4/94	Baseline 1/15/94	Revised Baseline 6/13/94	SDR -2 wks	
219-SE2-006 (P)	IRD Between ECS and ADCs	R. Dunning 0816							*25	5/31/94	ECS CCB 6/8/94	Wrk Copy 3/28/94	Wrk Draft 5/2/94	Prelim 6/13/94	SDR -2 wks	
219-SE2-015 (P)	IRD Between ECS and International Partners	P. Lyons 0302							*25	5/31/94	ECS CCB 6/8/94		Wrk Draft 5/2/94	Prelim 6/13/94	SDR -2 wks	
219-SE1-018	IRD Between ECS and TRMM	S. West 0770			PC				*25	5/31/94	ECS CCB 6/8/94		Draft 12/10/93	Baseline 6/13/94	SDR -2 wks	
219-SE2-019 (P)	IRD Between ECS and AM-1 Flight Project	C. Chachulski 0661	60	7	Mac	MacDraw Pro	same	no	*25	5/31/94	ECS CCB 6/8/94	Wrk Copy 2/18/94	Wrk Draft 2/28/94	Prelim 6/13/94	SDR -2 wks	
219-SE2-020 (P)	IRD Between ECS and NISS	C. Chachulski x0661 M. Armstrong x0439	50	1	Mac	MacDraw Pro	same	no	*25	5/25/94	ECS CCB 6/2/94	Wrk Copy 4/4/94	Wrk Draft 5/2/94	Prelim 6/3/94	SDR -2 wks	
219-SE1-021	IRD Between ECS and Color								*25		ECS CCB later date			Wrk Draft 6/13/94	SDR -2 wks	
301-DV1	ECS System Implementation Plan	A. Bowers x0643 S. Cassell x0679	100	25	Mac (from WPs)		Sean or Allan	no	200	5/11/94	ECS CCB 5/18/94			5/31/94	SRR Workoff	*Delivered 6/8/94*
302-DV2 (P)	ECS Facilities Plan	T. Jaeger 0715	30-40		Mac	*CAD drwgs	F. Hughes 0704	no	200	5/2794	ECS CCB 6/6/94			6/13/94	SDR -2 wks	
308-DV2	Software Development Plan	A. Winston 0353	same +50 pp	same +5 to 10	Mac	MacDraw Pro	A. Winston	probably	200	4/29/94	ECS CCB 5/9/94			5/25/94	SDR -2 wks	*Delivered 5/26/94*

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*Asterisk indicates number of copies that each referenced element or facility is to receive (not total copies)

Figure 4-3. Sample Master Schedule

4.3　Status Reporting

To aid in status reporting, the DMO maintains a point of contact ("Book Boss") within each ECS office preparing data/documentation. The DMO is responsible for tracking CDRL submittal and delivery dates and will support status reporting in several different ways:

- "Tickler" dates are built into the master schedule to allow DM to generate reminders of upcoming submittal dates for the office(s) responsible for the data item submittal.

- The DMO maintains and generates a report showing the status of all data items due to the customer. This report is presented to Senior Staff at the internal Project Status Reviews.

- In the case of overdue data, the DMO contacts the originator of the late data to determine latest status, reason for late submittal, any problem that management should be aware of, and anticipated new due date. This information is conveyed to management and the status report updated as appropriate.

- The DMO is responsible for the Documentation Delivery Status Report as part of Monthly Progress Reports (DID 111/MG3). This report is available on the EDHS.

- DMO supports on-line query of CDRL items. A detailed status report can be obtained that lists every CDRL item, submittal date, and responsible organization.

4.4　CDRL Generation and Internal Review

The CDRL originator/author is responsible for the accuracy of statements or data contained in the CDRL. Responsible functional office managers also review and approve CDRL items, and accuracy is further ensured by design reviews and configuration audits. While responsibility for originating and generating data items resides at the functional office level, the DMO assumes a proactive role through all stages of CDRL preparation, providing ECS personnel with clear procedures/project instructions, guidelines and ad hoc assistance for text and graphics generation, advanced notice of delivery dates, and careful schedule monitoring to ensure timely delivery.

While in preparation, data items are reviewed and approved by each of the participating functions involved. DMO coordinates the internal review and approval cycle with the originating project office, including responsible signatory authority at appropriate milestones during the document preparation process. There are two possible internal review and approval cycles for contract required data depending on frequency of submittal:

- "A" Review—contract required data that is submitted on a less than monthly basis undergoes iterative reviews, referred to as the "A" process: 1) conceptual review giving all participating activities and DMO a strong understanding of content and format as well as production and delivery considerations; 2) inter-office review that represents all ECS functional and programmatic areas; and 3) project management, or final level, review. The office manager responsible for document preparation and coordination has signatory authority over "A" reviews 1 and 2; the ECS Project Manager has oversight responsibility for reviews 1 and 2 and is responsible for final "A" review and signature.

- "B" Review—contract required data that is submitted weekly or monthly undergoes the "B" review process: 1) initial review for report format and generation process; 2) thorough review of test data; and 3) ongoing review for data validity. The office manager responsible for data preparation and coordination has signatory authority over "B" reviews 1 and 2, and is responsible for ongoing review for data validity; the ECS Deputy Project Manager has oversight responsibility for all "B" review levels and final signature.

4.5   Document Submittal/Release

Following Inter-Office Review and signoff or ECS CCB approval, the document is submitted to DMO in both hard copy and electronic forms. An Abstract and approximately 10 keywords must also be provided and will be included in the final document.

DMO numbers the document as described in Section 4.6, reviews it for completeness and format accuracy (to comply with NASA 500-TIP-2110), embeds all figures into the electronic file, adds contract-required front matter pages, and prepares the final hard copy master, verifying print quality and legibility. The master is routed to the Project Manager or CCB Head for final review and approval signature, along with one of the following items, attesting that the document has been reviewed and verified and is approved for submittal to GSFC:

- Signed Inter-Office Review and Comment forms from each Office Manager or designee
- Document Change Order (DCO) issued by CM

The document is returned to DMO in time for reproduction and shipping. A completed transmittal form (see Figure 4-4 for a sample form) must accompany the required number of copies of the document. Upon submittal, the document is logged as delivered in the tracking system. If required, electronic submittal of the document is prepared and delivered within 5 working days of the hard copy delivery. This status, too, is logged in the tracking system.

The signed master or "golden" hard copy is submitted to the Document Center for archiving. The master electronic file is compacted (along with any supporting files) and placed on the DMO server for retrieval by the Document Center staff. The Document Center staff retrieves the compacted file, archives it to optical disk, and logs the archive date and disk number in the tracking system (see Section 4.16). Once the document is archived, the files may be removed from any local hard disks.

Concurrently, a copy of the master electronic file is provided to the EDHS administrator for loading onto the EDHS. When the document has been loaded onto the EDHS, the Administrator logs the load date in the tracking system.

TRANSMITTAL NOTICE and REVIEW REQUEST

EOS Core System (ECS) Project   Contract No. NAS5-60000

August 13, 1993

Enclosed are the following documents:

CDRL Item	DID/ Document Number	Document Title	Qty.	*Disk	Current Submittal Form	Review/ Approval Date
025	193-205-SE1-001	Science Users Handbook	200	8/21	Final	
036	193-216-SE1-001	ECS System Requirements	300	8/21	Final	9/13/93
112	193-604-SE1-001	ECS Operations Concept	300	8/21	Final	9/13//93
039	193-219-SE1-001	IRD/ECS & External Networks	25	8/21	Final	9/13/93
039	193-219-SE1-002	IRD/ECS & MITI Aster Project	25	8/21	Prelim	
039	193-219-SE1-003	IRD/ECS & Landsat 7 System	25	8/21	Prelim	
039	193-219-SE1-004	IRD/ECS & Version 0 System	25	8/21	Final	9/13/93
039	193-219-SE1-005	IRD/ECS & Science Computing Facilities	25	8/21	Final	9/13/93
039	193-219-SE1-006	IRD/ECS & Affiliated Data Centers	25	8/21	Draft	
039	193-219-SE1-007	IRD/ECS & Network Control Center	25	8/21	Draft	
039	193-219-SE1-008	IRD/ECS & Program Support Communications	25	8/21	Draft	
039	193-219-SE1-009	IRD/ECS & Other Data Centers	25	8/21	Draft	
039	193-219-SE1-010	IRD/ECS & Ecom	25	8/21	Draft	
039	193-219-SE1-011	IRD/ECS & EDOS	25	8/21	Draft	
039	193-219-SE1-012	IRD/ECS & Code 421/AM Spacecrft Simulator	25	8/21	Draft	
039	193-219-SE1-013	IRD/ECS &Code 421/AM Spacecrtt/Instrumnts	25	8/21	Draft	
039	193-219-SE1-014	IRD/ECS & Code 421/AM Spacecrft PIs/TLs	25	8/21	Draft	
039	193-219-SE1-015	IRD/ECS & ESA	25	8/21	Draft	
039	193-219-SE1-016	IRD/ECS & FDF	25	8/21	Draft	
039	193-219-SE1-017	IRD/ECS & NASDA (ECS IMS Access)	25	8/21	Draft	
039	193-219-SE1-018	IRD/ECS & TRMM	25	8/21	Prelim	

Deliver to:

Data Manager

Figure 4-4. Transmittal Form Sample

4.6   Document Master Numbering and Control

4.6.1   Data Submission Identifier

Each CDRL document is assigned a unique number to ensure that the document and any revisions can be easily and accurately identified. All submitted data bear the CDRL/DID number; in the case of data items requiring multiple periodic deliveries or in which multiple documents support the data item, each data submission is considered a separate, sub-document. Such data items are identified in the CDRL and/or Preface of each document. These are identified by adding a dash-three digit number to the CDRL DID number. Numbering begins with -001 and shall be consecutive for each subsequent delivery under the data item. Examples:

- The first document submitted under DID 111/MG3 (Monthly Progress Reports) is identified as DID 111-001. Since this report is submitted on a recurring basis, the second submission would be numbered 111-002, the third 111-003, and so forth.

- A single data item may require multiple sub-documents to be delivered within the DID. For example, DID 219/SE1 specifies a number of Interface Requirements Documents (IRD) to be delivered as sub-documents within the "umbrella" DID number. For example, 219-005 is the IRD between ECS and the Science Computing Facilities, 219-001 is the IRD between ECS and External Networks.

- Multiple submittals of each sub-document due to changes or revision are identified by adding a dash 3-digit number following the sub-document number. Numbering begins with 001 and is consecutive for each subsequent submittal of the sub-document. See PI no. DM-1-002 for details on document numbering. The section below describes the data revision process.

4.6.2   Data Revision Level

CDRLs and other contract deliverables will be updated by means of a DCN or complete revision. Procedures for document control and maintenance are outlined in Data Management Procedures, DID 105/MG3. The following numbering scheme for revisions and changes will be followed:

- Document change notices (DCNs) will be issued when changes to the existing document total less than 50 percent of the document as originally issued. A three-digit DCN number is assigned consecutively from the original issue or last revision, for example DCN 001, DCN 002, DCN 099, DCN 100. If a new revision is issued, the DCN numbers start again with 001. NASA specifications (500-TIP-2110 , Code 505 Procedures., etc.) will be met in numbering additional pages, marking text with change bars, handling deletes and transfers, and other related procedures.

- Revisions are prepared when approximately 50 percent or more of the preceding complete issue has changed. This 50 percent can reflect numerous DCNs as well as a single change to a document. In this instance, the entire document will be reprinted, all change bars removed, and text reflowed to remove gaps. NASA document 500-TIP-2110 specifications will be met for renumbering pages, paragraphs, figures, and tables.

4.7 Document Delivery and Transfer

All contract required data items are submitted to GSFC's Code 505 distribution personnel using the preferred or alternate format indicated per the data item description. The DMO will establish an electronic transmission system in which all text-based documentation relating to the contract is compatible with NASA requirements as referenced in 500-TIP-2601, Standard for Automated Interchange of MO&DSD Technical Information.

The DMO staff works closely together to distribute the deliverable in quantity and format required. Distribution lists are created and electronic or hard copy sent as appropriate. DMO staff have responsibility for the accuracy and completeness of the distribution lists. For documents where electronic media is required, DMO prepares the media, transmits the documents to NASA, and prepares and delivers a disk for each document in the appropriate format.

All contractual data submitted to NASA has a standard transmittal sheet attached. This sheet contains key information about the data being submitted such as data item number and description, and submittal format.

DMO maintains the baseline document master and electronic media version for each data item. Dated, restricted soft copy is archived in the Document Center. Once the document is submitted, all draft and final versions are purged from Documentation Coordination files and are archived within the Document Center.

4.8 NASA Review Process

Contract required data items are assigned one of three approval codes:

- Documents with approval code 1 are formal contract deliverables which require Government review and approval prior to their acceptance and use. These documents shall be under ECS CCB control. ECS-approved changes to documents under ECS CCB control are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan. Class I changes approved by the contractor CCB are forwarded to ESDIS for final approval and are not to be implemented until contractual direction is received from the Government. Class II changes approved by the ECS CCB are implemented under the CCB's authority.

  At Government option, a few key documents may be designated to be under full Government CCB control. All changes to these designated documents require Government CCB approval before they become effective.

  The Government will whenever possible adhere to a 45-day timeframe for review and/or approval of the initial submittal and subsequent changes to approval code 1 documents.

- Documents with approval code 2 are contract deliverables which do not require formal Government approval. They must be delivered to the Government for review, and changes may be requested by the Government reviewers. NASA reserves a time-limited right of disapproval (45 days) for the initial submittal. ECS-approved changes to approval code 2 documents are handled as described above.

- Documents with approval code 3 are to be reviewed and controlled by ECS. This documentation is delivered to NASA for information only, but is subject to approval as meeting contractual requirements. ECS shall provide titles and release dates for these documents to the Government in advance of their publication so that Government personnel can obtain copies.

GSFC and Hughes should agree to a review and approval system to ensure that revisions are thoroughly addressed with minimum impact on schedule. The following method is proposed for Approval Code 1 documents; however, it could easily be tailored for each document level:

- GSFC and ECS management establish a standard timeframe for distribution and review among GSFC staff, DAAC personnel, and others as appropriate. In cases where CDRL items require broader than usual review, GSFC and ECS management will adjust the timeframe prior to receiving the deliverables.

- CDRL items are delivered at contract due date in specified format.

- The Chief of ESDIS Development or his designee informs ECS if the document is approved as delivered.

- If a document requires further discussion, ESDID contacts the person named as the lead author in the Document Delivery Status Report (submitted as part of monthly progress report). A review meeting is scheduled and additional review copies are supplied if required.

- At the meeting (which could possibly be a formal review or project status meeting, or a teleconference), ESDIS presents a coordinated set of comments for the document.

- All attempts will be made to resolve review comments at the meeting.

- For any review comments not resolved at the meeting, a schedule of comment completion and/or action item list will be provided to ESDIS .

- When ESDIS and DMO agree all comments are resolved, the document will be revised to reflect the comments and then delivered to ESDIS in specified format. An accompanying letter and detailed matrix references comments and resolutions.

4.9   Data Storage and Retrieval

The Document Center/Reference Library contains a large number of DMO-maintained documents and types of data including project documentation such as CDRLs and other documents required by contract, technical papers, and white papers, as well as supporting data determined to be critical to documenting ECS development. These data include drawings, contract correspondence, NASA technical directives, meeting notices and minutes; and COTS software product documentation and vendor catalogs.

The Document Center is the repository for all DMO-Maintained document masters (both hard copy and electronic) and Document Center staff is responsible for ensuring that all DMO-Maintained document masters are archived and maintained as controlled documentation, but retrievable on demand.

The Reference Library houses copies of DMO-Maintained documents and other related documents for use by ECS Project staff. A list of items housed in the Reference Library is available on-line to ECS staff. New items are submitted by staff, as well as sought and collected by Reference Library personnel. Updates to the list are published periodically. DMO procedures require each ECS office submitting deliverable data items to include bibliographical information on any supporting documentation used in originating or generating the CDRL or compliance document. Documents listed are above and beyond those cited as references in the deliverable, and are indexed with reference to the appropriate deliverable.

To ensure as complete a collection as possible, DMO maintains strong lines of communication with staff at other reference facilities such as GSFC's Mission to Planet Earth Library, NASA's Scientific and Technical Program, and Hughes corporate resources, to stay abreast of ECS-related literature to be added to the Reference Library holdings.

4.10 Data Archiving and Deleting

As outlined in PI DM-1-015, data archiving is facilitated using the DMO Transfer Station server. Using software resident on DMO station, the document coordinator compresses all related files in to a single archive file. The document identifier number is used as the archive filename with the extension ".sit" to identify it as "archive."

The archivist writes the compressed archive from the DMO Station to a numbered optical disk and updates the archive status on the CDMTS, including the optical disk number for future retrieval. Once each document is archived to optical disk, the archivist is responsible for removing files from the DMO station and keeping it current.

The document coordinator maintains a set of original files as backup until the coordinator verifies that the archive has been logged onto the CDMTs and that a disk number has been entered. Once verified that the document has been archived, the coordinator discards the backup copy. Weekly reports run from CDMTS are housed in the Document Center to facilitate document retrieval.

4.11 Data Numbering and Cataloging

As documentation is stored in the Reference Library—or in the case of controlled documents—archived in the Document Center—DMO staff enter identifying and cataloging information into the CDMTS. Each new entry is assigned a unique number, depending on the origin/project office and type of data. CDRLs and other ECS-generated data retain numbers assigned during preparation. Documents previously identified/numbered by someone other than ECS retain their original identity and are entered as such in the CDMTS, with a Library number serving as cross-reference. This numbering and identification system is outlined in PI DM-1-002.

The DMO verifies proper submission of information into the system, including valid numbering, and provides supplementary cross-references as part of the catalog database. This includes complete bibliographic source information, and Reference Library location.

4.12 Data Abstracting

The DMO publishes a summary of new holdings as part of its Library Report; a compendium of all holdings suitable for dissemination is maintained in the EDHS.

4.13 Indexing

DMO staff are responsible for implementing a computerized index which contains Document Center holdings. The index, produced by the CDMTS, provides capability to search and report on criteria such as document number, document type, publication/delivery date, point of contact, and other fields.

To assist in retrieving stored documentation, the DMO will establish index catalogs from this database. While there are multiple ways these data can be sorted, identification on configuration control and accessibility is an overarching consideration. Possible sort fields include:

- Approval/Review code
- Due/Acceptance date
- Document hierarchy
- Data type (e.g., CDRL, White Paper)
- Responsible functional organization or author/institution

4.14 Documentation Control

DMO provides appropriate security for documentation, documentation control, history files, and archiving through the Document Center and the EDHS. Once a document is released, no changes will be permitted except upon issuance of a DCO by appropriate segment or ECS CCB or signatory authority for those documents under management control. Using the document masters maintained in the Document Center to validate all original releases and any subsequent changes, the Configuration Management Organization exercises change control over CCB-approved documents. Official change status for such documents is available from the CDMTS.

DMO issues the document control number under which the document is listed and controlled, and adds appropriate revision numbering when a document or drawing is revised. As documents are updated and changed, an updated file is implemented and the electronic and hard copy masters are entered into the Document Center. Each change is entered into the CDMTS and reports are published periodically.

Changes to data items not under configuration control and other ECS documentation are directed by ECS procedures that require each revision to be reviewed and approved in the same manner as the original. See PI DM-1-001 for definitions of document types and their control levels.

4.15 Data Dissemination

DMO is responsible for two major types of data dissemination: 1) coordinating the delivery of documents to designated addresses or to participants as directed by reviews, audits, project status

meetings, and action items; and 2) supporting ad hoc search and retrieval of stored data that was either previously delivered as required above, or that has been acquired because it is related to the ECS Project. It is a DMO objective to disseminate all data utilizing the most appropriate traditional reference and state-of-the-art electronic resources available. The EDHS is able to satisfy these requirements. Through the use of anonymous ftp, large data files can be compressed and stored allowing users with Internet access the opportunity to receive documents electronically. Additionally, in preparation for milestone reviews, special HTML pages are designed with direct links to all review documentation. The need for the delivery of boxes of paper copy can be reduced significantly.

4.15.1 Scheduled Distributions

CDRLs and their supporting documentation constitute the majority of data scheduled for distribution. Scheduled distributions occur in the format and quantity required, and are supported to the fullest extent possible by electronic transmission. In addition, documents are placed in the EDHS at the appropriate access level.

4.15.2 Ad Hoc Query, Search, and Retrieval

Aside from scheduled deliveries, DMO and the Document Center will support ad hoc queries from ESDIS project staff and DAAC personnel as well as from members of the science community and general population. Ad hoc query, search, and retrieval is supported by the EDHS. Any authorized user across the Project who has network computer access will be able to conduct an on-line data search of available documentation holdings and download a copy of the data of interest.

Access control is provided at multiple levels as discussed in para 3.5.3. Users may be considered as members of an access group: community, project, and ECS internal. Protected collections do not permit queries and may only be accessed directly. However, on-line searches may be performed against metadata information or full text searches of documents that are stored in electronic form at the community level. The metadata includes information about the available media format (softcopy/hardcopy). Documents that are maintained in hardcopy only may be ordered with an email request, or by using an electronic form feature available on many Mosaic-like browsers.

While DMO's objective is to implement an on-line, automated search and retrieval system, it is prudent to assume that many of the requests for documentation will be via phone, fax, in writing, or in person. All requests will be addressed, regardless of the request and transmittal modes, and DMO will adhere to strict procedures concerning data security/confidentiality, and for logging and tracking user volume.

4.16 Data Security Procedures

Updates and changes to the Document Center/Reference Library system and/or data will be implemented through the configuration process, and will include approval procedures, access procedures, and change procedures. DMO will be supported in these efforts by Configuration Management, the Quality Office, and Project management.

Routine diagnostic checks of media reliability and data security procedures, including virus control, are used to ensure neither data file nor databases are corrupted and that data integrity is assured. Audit trails and standard file backup procedures will be an integral part of the DMO protection system. All data are backed up periodically, using both incremental and total backup. To provide for disaster recovery and damage control, additional soft copies will be maintained.

4.17 Library Status Reports

The DMO will capture data on the type and volume of ad hoc requests for ECS documentation. These statistics are categorized to the extent possible by user, type of document requested, and frequency of request, and presented to ESDIS as they request.

104-CD-001-003

Abbreviations and Acronyms

CCB	Change Control Board
CDRD	Contract Data Requirements Document
CDRL	Contract Data Requirements List
CDMT	Configuration/Data Management Tracking System
CMO	Configuration Management Office
DAACs	Distributed Active Archive Centers
DADS	Data Archive and Distribution System
DBMS	database management system
DCO	Document Change Order
DID	Data Item Description
DM	data management
DMO	Data Management Office
ECS	EOSDIS Core System
EDF	ECS Development Facility
EDHS	ECS Data Handling System
EDMP	ECS Data Management Plan
EOSDIS	Earth Observing System Data and Information System
GSFC	Goddard Space Flight Center
IMS	Information Management System
IP	Internet Protocol
NCSA	National Center for Supercomputing Applications
PMR	Program Management Review
WAIS	Wide Area Information Server